

# *The* HARPSICHORD



## A Compleat Method, for

Attaining to Play a Through Bass upon either Organ, Harpsichord or Theorbo<sup>Lute</sup>  
by the late Famous

MR. GODFRY KELLER

with

Variety of Proper Lessons & Fuges, Explaining the several Rules through-out the  
whole Work; & a Scale for Tuning y<sup>e</sup> Harpsichord or Spinnet, all taken from his own  
Copies which he design'd to Print. Note in this Celebrated Work for y<sup>e</sup> ease of  
Practioners all y<sup>e</sup> Chords are correctly explain'd both with Figures & Notes.

London

Printed for Richard Meares Musickall Instrument Maker at the Golden Viol & Hautboy in St. Pauls Church Yard.

# HARPSICHORD

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Editor & Publisher: *Harold L. Haney*

Art Director: *Edwin Golikoff*

## Contributing Editors:

*Hugh Boyle: London, England*  
*Bjarne Dahl: Sunnyvale, Calif.*  
*Dr. George Sargent: Allison Park, Pa.*  
*Wallace Zuckermann: Stafford Barton, England*

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Requests for membership or additional information may be sent to International Harpsichord Society, P. O. Box 4323, Denver, Colorado 80204.

## MOVING?

A change of address card must be on file at *The Harpsichord* office in order to receive missed issues, due to address change, without cost.

## THE COVER

This issue we duplicate a cover which appeared in 1717 on an instruction book for keyboard instruments, lutes and theorbos. Gottfried Keller was a highly respected music teacher in England. There were several editions of this work, 1705, 1707 and the one shown here, 1717.

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# ACKNOWLEDGEMENTS

*The International Society of Harpsichord Builders is proud to give special recognition to the following Contributing Members whose interest and generosity aid materially in the development and preservation of the instruments and music of the baroque period and assists in furthering the various projects and programs of the Society.*

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# GO FOR BAROQUE

by *Hal Haney*



We are always happy when advertisers select our journal as part of their campaign. It not only keeps our members informed of services and activities pertaining to harpsichords,

but aids greatly in helping meet our publication costs.

A new and valued advertiser appears for the first time in this issue. The Choate School of Wallenford, Connecticut announces a series of harpsichord and organ seminars which will be held from July 18 through July 31. Starting on Sunday and ending on Saturday, the fourteen day period includes a wide selection of Master Classes, lecture demonstrations and concerts for both harpsichord and organ. Outstanding international artists are scheduled. The program is sponsored by the Music Department of Choate and inquiries should be sent to Duncan Phye, Director, P. O. Box 3977, Wallenford, Conn. 06492. As many members as possible, should plan to attend this excellent activity.

A recent business trip to California gave us a long awaited opportunity to visit the Sunnyvale home and adjacent shop of Bjarn Dahl who is rapidly becoming recognized as an important restorer of ancient keyboard instruments. We were able to get an indepth interview and many photographs which will appear in a future issue.

We were also delighted to meet Ron Haas of Aptos, California, a talented builder of both single and double strung clavichords. His prices

(Continued on next page)

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are very reasonable for a completed instrument. Ron is one of the earliest members of the Society having joined back in November 1967. He also contributed much valuable information which was helpful in forming the organization at an even earlier date. We look forward to interviewing him at his shop in the future.

A lunch with I.H.S. member Paul Mull in San Francisco uncovered his plan to convert his garage into a small recital hall. A wonderful idea . . . and one less car is good for our ecology too!

Our membership drive mentioned in the last issue is coming along nicely. We have received about 45 new members so far, most of them resulting from the small ad in the Saturday Review. The Diapason continues to produce inquiries, but High-Fi Stereo Review with a circulation of several hundred thousand has only produced three inquiries. Perhaps their readers are more interested in listening than participating.

Several members have offered excellent ideas for increasing membership and improving our journal. These suggestions will be put into effect as the opportunity arises.

One suggestion telephoned in by a member, encouraged the use of monthly payments for those wishing other than subscribing membership. In this way, a member with a limited monthly income could still participate as Contributing, Sustaining or Patron members by donating a part of the annual dues each month. An excellent idea which we have immediately put into effect. We are now set up to receive these time-payment memberships.

I threw Wallace Zuckermann a curve and scheduled this issue for the printer in advance of our regular deadline. Since I did not notify Wallace in time, his current column will appear in our next issue.

After more than a year of hunting, designing, testing and fabricating, we have finally produced a beautiful

binder for back issues of *The Harpsichord*. These binders are made of heavy end boards covered with durable dark green plastic which looks and feels like fine leather. (We priced leather and rapidly changed our minds about that!) The title "*The Harpsichord*" is printed in  $\frac{3}{4}$  inch letters across the front in hot stamped 18 carat gold. The title is also printed in gold on the spine, but vertically so it reads correctly as it stands on your bookshelf. Metal rods hold each issue in place and permit the binder to be opened fully. We have added a file pocket to both the front and back inside covers so you can keep notes, clippings and other reference papers on hand.

Included with the binder is a comprehensive index covering Volumes I, II and III which makes it easy to instantly find any article, subject or author. All entries are cross indexed and give additional information including the length of the article as well as number of photographs, diagrams or illustrations. Where necessary for clarity, the column number is given as well as page, issue and volume. Important names, instruments or facts within an article are also indexed to aid one researching a particular subject.

These good looking binders cost the Society \$5.00 each and they are being offered to members at that same price, plus 50c for postage. This makes the total package \$5.50. These binders will protect your back issues for many years and automatically create a reference volume which contains a wider range of information of harpsichords and clavichords than any book published.

We have only 100 of these binders so if you are interested in ordering one for your library, it is important that you get your order and check for \$5.50 into the mail as soon as possible. If you have all back issues you should consider buying two binders since we are already midway into our 4th volume and each binder holds only three volumes.

Hal Haney

## From LONDON

by Hugh Boyle

While thinking about some of the work on theoretical tunings, I had occasion to examine, more closely than I had previously done, the tuning scheme for Meantone tuning given on page 18 of *The Harpsichord*, Volume III, number 3. The net result of this was that I decided to do a check on the figures given. I worked out the figures to a higher degree of accuracy than they were given in the article. (This is the only valid way of checking on this sort of thing.) Not that they had not been stated to enough places, but simply to check (1) if they were correct and (2) if the figures were correct to the number of places that had been given. So far as (2) was concerned they seemed to be fairly satisfactory, but there appeared to be an error (I presume it to have been an error rather than a misprint because the metronome figure — so far as I can recall — matched up with the beat-rate given. These were, from memory, 1.43 and 88.) for the upward fourth G35 - C40. Here are the figures according to my calculations.

A37 - E44	2.05	123
E44 - B39	3.06	183
A37 - D42	2.74	164
D42 - G35	1.83	110
G35 - C40	2.45	147
C40 - F33	1.64	98
F33 - Bb38	2.19	131
Bb38 - Eb43	2.93	176
B39 - F 34	2.29	137

I offer the above figures for any one who wants to correct their records. I do not, in any way, want to offend the writer of the article who did an excellent job and much research. These calculations are at times difficult to carry out and are tedious to everyone. I know how errors can creep into things. I made some mistakes in my own book *Intervals, Scales and Temperaments* with some of the Meantone figures.

Hugh Boyle  
London, England

# Hilda Jonas Launches New Harpsichord Festival

Mendocino, California is the location of the newest harpsichord festival scheduled by harpsichordist and instructor, Hilda Jonas. June is the month selected for this musical gathering by the sea.

Miss Jonas has for many years headed the Put-in-Bay, Ohio Festival which has been highly received by students from many parts of the world.

The Mendocino Festival is the result of a successful concert tour which Miss Jonas made to the west coast last season. Commercial recordings of her playing are scheduled to be released shortly.

Miss Jonas is also contemplating another festival at her studio in Ohio which is planned for October. She owns three excellent harpsichords and some times participants bring their own instruments, adding to the variety of harpsichords each student can play. Detailed information on the above festivals may be obtained by writing to the Hilda Jonas Studio, 3942 Ledgewood Drive, Cincinnati 29, Ohio.

## Unique Harpsichord Building Course Announced

The German harpsichord builder Klaus Senftleben of Buxtehude has announced the opening of his new workshop, showroom and recording studio in Lamstedt, Germany, near Hamburg. Beginning in the Spring, 1971, Senftleben will be giving 3-4 week vacation courses in harpsichord building for amateurs in this new facility. During this period, 10 to 12 participants will individually construct a small harpsichord from a kit designed by Klaus Senftleben under his personal supervision.

Prerequisites for the course are the purchase of the kit and some manual skills. Other activities available to the group include indoor and outdoor swimming, sailing, water sports and riding and hiking in the vast wooded areas of this scenic region of North Germany. Musical activities will also be organized. It is anticipated to offer courses year around as the demand arises. Living accommodations will be arranged locally to suit individual needs.

Elmer Magnuson, P. O. Box 14401, Santa Barbara, California has been appointed as United States representative for Senftleben instruments. For information regarding details of the harpsichord building course, letters should be sent to Klaus Senftleben, 2150 Buxtehude, Jahnstrasse 28, West Germany.

## Harpsichord Workshop Scheduled for Texas

A three-day harpsichord workshop, featuring a panel of noted musicians in addition to studies of aspects of harpsichord pedagogy, will be conducted during the summer at Texas Christian University, Fort Worth. Dates for the initial study program are June 29 - July 1.

Announcement of the workshop, sponsored by the University's music department and offered through TCU's Division of Special Courses, was made by Dr. Michael Winesanker, School of Fine Arts music chairman.

Mrs. Marilyn Olsen, TCU instructor in organ and harpsichord who is one of the organizers of the Dallas-Fort Worth Harpsichord Society, will conduct the workshop. She has traveled extensively studying the instrument and visiting major museums in Europe and the United States.

Mrs. Olsen will present a lecture "New Interest in the Old" during the three-day session. She is well known for performances on her hand-crafted instrument which is designed in a variety of national styles. Mrs. Olsen built the instrument following her travel studies. She will offer both travel slides and films of her tour as well as lectures on the history of the harpsichord during the workshop.

"Periods of society are structure, and people are constantly looking for the structure and meaning to life," explained Mrs. Olsen. "Right now in several phases of society we are returning to the past, repeating history. This is the reason behind a renewed interest in very old music forms and the instruments used to produce that music."

Aspects of harpsichord pedagogy, including bibliographies, music and special reading, will be discussed during the three-day program. Merits of various materials used in creating the contemporary instrument, with special emphasis on the new harpsichord "kit", will be discussed by a panel of noted musicians and a concert of works of Spanish composer Antonio Soler will highlight the summer event. For information write Special Courses TCU, Fort Worth, Texas 76129.



# Notes on the Broadwood Grand

by Frank Miller

In 1913, Constable & Col. Ltd. of London published a book by William Dale, F.S.A., entitled "Tschudi the Harpsichord Maker." Dale had spent the earlier years of his life in the house in Great Pulteney Street, Soho where Burkat Schudi had lived and carried on his trade more than a hundred years earlier, and was a close friend of A. J. Hopkins of Broadwood's, the author of many articles in the first edition of Grove's dictionary, and of a "History of the Pianoforte" (1896) which is still regarded as one of the standard works on the subject.

Facing page 12 of Dale's book is a photograph of a grand pianoforte of 1793 by John Broadwood. Dale's description of it appears on page 11 and reads as follows: "It would not be fair to close this brief account of the English harpsichord without saying a word concerning the singularly beautiful grand piano which replaced it, an instrument as unlike a modern grand as can well be imagined. I possess one of 1793 made by Schudi's son-in-law John Broadwood, which is numbered 521 and is exactly similar to the instrument Joseph Haydn must have played upon in 1792 at his own and Madame Mara's concerts at Salomon's Rooms. The grands of this period were made exactly on the lines of the harpsichord, supported on a frame, and with the pedal feet projecting from each front leg. The curve of the bent side was even more elegant than that of the harpsichord. The hammers were covered with hard and thin wash leather to produce a harpsichord tone. The loud pedal lifted the dampers from the strings as now. Each note had three strings, those in the bass being thick brass wire only, and it was possible by means of the soft pedal to shift the hammers not only onto two strings as in modern grands, but also onto one only, which is not possible now. This is the 'una corda,' a sign found in the writings of old composers, which has now be-

come meaningless. The sympathetic vibration of the untouched strings produced a beautiful effect."

This piano is now in our home at Dorking, Surrey, and my wife plays on it almost every day. It is perfect for harpsichord music, and makes the music of Haydn, Mozart, and Beethoven — and of their lesser contemporaries — sound as fresh as on the day on which it was written.

How it came into my possession makes an interesting story. Some twenty years ago, we were living in the north of England — near Manchester — and one Saturday morning my telephone rang. The caller said, "My name is so-and-so, a solicitor in Manchester. You will not know me, but I have been given your name as possibly the only person in these parts who might be interested in buying an old grand piano. I am closing a small estate, and have applied to a specialist restorer in London, but he says it is too far for him to come, and has suggested I ring you." No explicit details were available, and I, expecting the usual Victorian grand, was in no hurry to go and look at it. However, eventually I did, and was astounded to see a piano identical with Dale's, but dated 1796. I bought it and had it restored and re-strung by a superb Salford (Manchester) craftsman, John Hughes, and eventually brought it to Surrey when I returned to work in London in 1958.

A year or two after that, I attended a private lecture-recital given by Paul Badura-Skoda to members of the Royal Musical Association, on "Beethoven on pianos old and new." He was using for illustration purposes a Broadwood grand of 1805, and when the recital was over I told him about the 1796 grand we had at home. Very soon after, he visited us and played on it — I have never heard anything so thrilling — and asked me, if I possibly could, to find him a similar instrument. Well, of course, they are

few and far between nowadays, but by an odd series of coincidences I was within a few months put in touch with the then owner of our 1793 Broadwood, who had himself bought it from William Dale in 1926, so we decided to purchase the 1793 instrument, and to let Badura-Skoda have the 1796 piano, which he so much admired. This is now in Vienna, and he has made commercial recordings of Haydn's music on it. The record I have is of Sonate Es-dur, Sonate h-moll, and Variationen f-moll, recorded in the Palais Schoenberg in Vienna in May 1962, issued by Harmonia Mundi, (HM 30634). It is amusing to watch the faces of musical friends when these records are played, especially if they have not seen or heard an early grand piano before.

In the eighth edition of the "Encyclopaedia Britannica," published towards the end of last century, Hopkins wrote a long and very informative article on the pianoforte, tracing its history from the first experiments of Cristofori, and explaining how John Broadwood, in 1791, decided to redesign the grand piano of his day, which was in fact no more than a harpsichord fitted with a striking instead of a plucking action. On the advice of leading scientists of the time, he lengthened the case, added an extra half-octave of notes at the top of the compass — the so-called "additional notes" — and put two separated bridges on the soundboard, one for the bass (all brass) strings, and the other for the treble. The action he used was so effective that it continued to be standard until the '80's of the last century, and the casework appears to have been designed by Sheraton. Altogether a remarkable achievement, of the lasting powers of which I was forcibly reminded when I met John Broadwood's direct descendant, Capt. Evelyn Broadwood, the present head of the firm, some little time ago.

Yes, it is worth while seeking out and preserving these beautiful instruments.

F. H. Miller

Dorking, Surrey, England

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# BUILD YOUR OWN

by Dr. James R. Scroggs

They called me a moldy fig — the guys I used to listen to jazz with. A moldy fig is a cat who collects only scratchy 78's recorded (mechanically) before 1930. My taste has since become more cultivated — from jazz to baroque — but my antiquarian penchant, alas, still lingers. And what could be more natural given this temperament plus my newly acquired avocation of harpsichord building than that I should build a reproduction of an antique Italian harpsichord — the earliest, simplest, and purest form of the instrument.

The Italian harpsichord is in many ways, the ultimate for the purist. Its slender, delicate, and gracefully curving shape is a sheer delight to the eye. Its inner structure, reminiscent of the gothic buttressing of ancient cathedrals, is aesthetically and intellectually wedded in a perfect functional union. The careful attention to detail in its many moldings will warm the heart of the true craftsman. And its crisply articulated tone, so adept at cutting through an instrumental ensemble, will affirm that this is no plucked piano but a unique instrument. No marvel of machine stops, foot pedals, or Venetian swells this! Rather, the unaffected simplicity of its 2 x 8' disposition discloses an integrity of structure and function to be found nowhere else in the history of harpsichord building.

The actual opportunity to build an Italian harpsichord came to me in the form of United States National Museum Bulletin Number 225, entitled *Italian Harpsichord Building in the 16th and 17th Centuries*, written by John D. Shortridge. The major illustrations are reproduced here and they will constitute the foundation upon which the succeeding construc-

# ITALIAN HARPSICHORD

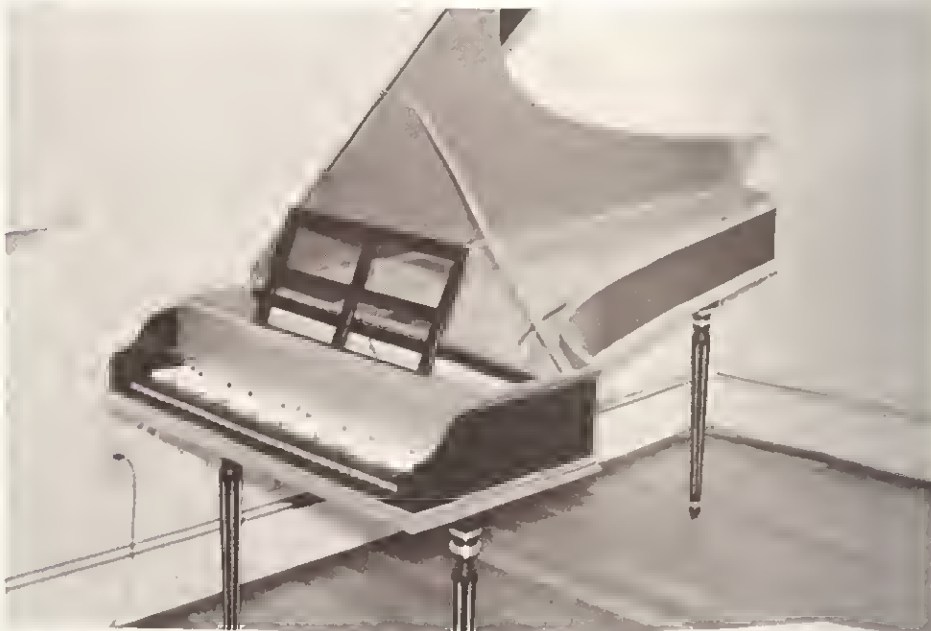
tion details are based. To copy an antique harpsichord one must have either the dismantled original to go by, or a set of scale drawings. It is the latter which Shortridge so graciously provides. Not complete, mind you, and not full scale; but enough to go on nevertheless.

I have made two reproductions of the Ridolfi harpsichord of 1665 described by Shortridge on pages 12-17. They differ from each other only in minor details. What I shall do in the lines that follow is to explain the manner in which I built these two instruments, indicating how I derived those specifications which Shortridge does not provide, and also suggesting several possible modifications of the original instrument. My intention is that, given this article plus the Bulletin, and a few other sources which I will mention, you will have all the information you need to build one of these instruments. For those who will not be

building, or at least not building this instrument, there may nonetheless be some worthwhile tips of the trade.

Your first task is to transform the 1/8 scale drawings on p. 13 into one full scale drawing. This could be done by photographic enlargement, but I chose to do it mechanically, measuring Shortridge's drawings as carefully as I could. The final drawing from which you build should be done on mylar film to insure stability and permanence.

At this point I made several modifications which you may choose to ignore. First I expanded to compass by filling out the base short octave, and I carried the treble up to f". Thus four notes were added to the base and five to the treble. (I felt that modern players might find the base short octave especially disconcerting.) My method was to extrapolate — simply to extend on my drawing the bridge, nut, and case sides sufficiently to carry the additional strings. In so doing, I arrived at a plan that is



This harpsichord was constructed by Dr. Scroggs from the instructions given in this article. The interior is bright Chinese red and the outside is black. The mouldings are gilded. The legs are turned and fluted in Louis XVI style.



32 $\frac{3}{8}$ " wide and 75 $\frac{3}{8}$ " long (on the bottom, i.e., not including the thickness of the case sides). Note that I did not move the bentside in relation to the bridge, pinblock, etc. Secondly, I redesigned the system of internal bracing in an effort to make it stronger without making it heavier and using as a model the interior view of an Italian harpsichord found in Plate II of Frank Hubbard's *Three Centuries of Harpsichord Building*.<sup>1</sup> Experience has taught me that the case is still woefully unstable. In fact, if the instrument has a fault this is it. How to make it stronger without adding to the weight is a vexing problem. There is a strong twisting action lifting the joint where the bentside meets the tail. I can only suggest more diagonal braces running from the hitchpin rail-liner to the bottom at the spine. I suspect that the manner of bracing is irrelevant to the tone as long as the weight of the case is not changed drastically. Certainly the instrument can be built without either of these modifications or with only one or the other. Both of my instruments include both of these modifications. One also has the mitered base section of the bridge moved  $\frac{1}{2}$ " closed to the tail, which I feel slightly improves the tone of the notes involved.

Once you have a drawing, begin erecting the knees, braces, pinblock, etc. on a  $\frac{1}{2}$ " birch plywood bottom. Knees and braces should probably also be of hardwood plywood. Mine are whitewood and hence not quite so stable. The pinblock is solid maple. Laminated would be better. Liners are also maple. Dimensions for these can be derived from Shortridge's drawings.

Make from  $\frac{1}{8}$ " brass stock two "I-beam" spacers to span the gap between the pinblock and belly rail. Install them opposite the belly rail knees at a height that will bring the top of your registers even with the top of the soundboard. Be sure they are under a close pair of strings so that they will not interfere with the jacks. (See Figure 11)

<sup>1</sup> Frank Hubbard, *Three Centuries of Harpsichord Building*, Cambridge: Harvard University Press, 1965.

When the knees, braces, liners, and pinblock are erected on the bottom, you may either install the soundboard or attach the case sides. I prefer doing the case next. My first model has 5/32" whitewood sides. This very closely approximates the density of the cyprus of the original. My second model has 3/16" luan plywood—much easier to obtain, less prone to split, about the same weight, but the devil to fill and finish. The sides are simply glued to the bottom, knees, liners, etc., the bentside requiring some fantastic gymnastics with the clamps.

The moldings on the case are functional as well as decorative. Don't ignore them. I obtained picture frame moldings closely approximating the moldings of the original. After sawing off the lip, I applied them to the top and bottom of the case sides. If you have a router, of course, you may choose to make your own moldings.

The soundboard of the original is cyprus. I have used  $\frac{1}{8}$ " quartered spruce. The 1682 Ridolfi in the museum of the Rhode Island School of Design has a spruce soundboard. Quartered spruce in  $\frac{1}{8}$ " and  $\frac{1}{4}$ " thicknesses is available from: Craftsman Wood Service, 2727 South Mary Street, Chicago, Illinois 60608. The dimensions of both the nut and soundboard bridge are given in the text of the Bulletin article. Maple, cherry, beech, or walnut make nice bridges. Cherry or walnut provide a touch of color. Do take time to carve the scrolls on the ends. The beauty of the Italian harpsichord is not solely in its graceful shape but also in its meticulous attention to detail.

Very close to the essential mystique of harpsichord building is the making and placing of the soundboard ribs, so they say. In my first model the ribs are placed exactly as Shortridge shows them. Of course, with my wider case they are longer, extending to the liners. In order to avoid the dead notes which are said to occur when bridges cross ribs, I cut about  $\frac{1}{8}$ " x  $\frac{1}{2}$ " away from those two ribs that are crossed by the bridge at the point where the bridge crosses and on the side of the

rib that is glued to the soundboard. There are no dead notes in my instrument. The ribs, like the soundboard, are made of quartered spruce. Shortridge gives the width but not the depth of the ribs. My dimensions are nothing more than a slightly educated guess based on the width and common angle of taper; but I find them to provide adequate soundboard stiffening and very pleasing tone. Figure 9 shows the rib dimensions.

In my second version of the instrument, I tried the more familiar pattern of soundboard ribbing with a diagonal cutoff bar running nearly tangent to the bridge and one lighter rib perpendicular to it running back to the belly rail-spine joint. This arrangement I judge to be less satisfactory, though by no means unworkable. The tone of the two instruments does not differ greatly, although it is hard to make a precise judgment since one model has delrin plectra and the other has leather. I would venture that the original method of ribbing makes for a harder more brilliant tone while the cutoff bar may be as much a factor as its presence or absence. In any event, the cutoff bar does not stiffen the soundboard as much as the transverse ribs, with the consequence that the bridge in my second model has sunk slightly and tends to move with more climatic changes. Since the instrument already has stability problems, I would recommend not compounding them by using the cutoff bar. Cutting out the transverse ribs under the bridge seems to remove any objections to their use anyway.

Glue in your soundboard then, pin your bridges, put in your hitchpins (There is no hitchpin rail in Italian harpsichords.), and you are ready to string. Strings and tuning pins are available from: Tuner's Supply Company, 94 Wheatland Street, Somerville, Mass. 02145. Shortridge has not specified a stringing list. I used the list on p. 6 of Frank Hubbard's *Harpsichord Regulating and Repairing* as a guide.<sup>2</sup> In fact, I found

<sup>2</sup> Frank Hubbard, *Harpsichord Regulating and Repairing*, Boston: Turner's Supply, Inc., 1963.

it necessary to depart from Hubbard's list only on the six lowest notes where I went to slightly heavier strings. But the thing to do is to experiment with several different gauges until you find one that sounds best to you.

I am not so much a purist as to follow Ridolfi in making a keyboard with a rack. Use front rail pins and put them in the front rail if you like. I put mine in the back rail, as was the custom in the upper manuals of some French double harpsichords. It is easier, especially if you make your keys only  $\frac{1}{2}$ " thick, and it works just as well. Incidentally,  $\frac{1}{2}$ " keys do look nicer with arcaded fronts. To cut out arcaded key fronts, I filed a cutter bit from brass stock, stuck it in my drill press (just the electric drill type), and though it didn't stay sharp too long, found it quite adequate to the task. (Use soft wood, of course.)

If you have never made a keyboard, there is no need to be stymied. The process is described in detail in Hubbard's *Three Centuries of Harpsichord Building* on pp. 220-223. Needless to say, you cannot use any commercially available ready made keyboard. The chances of its fitting are extremely slim. Don't waste the time looking for one; make your own. Pins, felt, etc. are available from Turner's Supply Company. (They also have ebony sharps if you don't want to make them.) The dimensions of your keyboard will be determined by the width of your stringbank and the distance from the front of the case to the belly rail. Be sure to angle your balance rail so that the ratio between the distance from the front of the key to the back of the key is constant throughout the keyboard. This will insure evenness of touch.

The registers present a problem to which there are many possible solutions. I do not contend that mine is in any sense the ultimate, but I offer it for what it is worth. (I gather the original has a box slide, which only a fanatic would try to duplicate.) My solution is to cut four battens  $\frac{5}{8}$ " x  $\frac{3}{8}$ " and about 36" long from beech. I then dado out a groove about  $\frac{3}{16}$ "



This photograph illustrates the Ridolfi harpsichord removed from its outer case. The graceful curve of the bent side, and the bridge which follows it are obvious. Openings in the soundboard give a hint as to the ribs and bracing which are illustrated more fully in the drawing on page 13. Notice the absence of a hitch pin rail. This is typical of Italian instruments.



deep and as wide as my jacks ( $\frac{3}{8}$ " for Hubbard jacks) along the length of each. Now I have four wooden "channels". The groove is on what will be the bottom of each register. (Registers and lower guides are both the same in this system.) Next, I mark out my stringband on the top of each. You can mark this out from your keyboard or from your *regle du clavier* if you have one. Then I cut a dado  $\frac{3}{16}$ " deep and as wide as my jacks are thick (.160" for Hubbard jacks) across the registers at each mark. (Clamp the four registers together side by side and cut across all four at once.) This cut is just deep enough to reach the lengthwise dado on the other side and so opens up a series of rectangular holes just the right size for your jacks to slide through. Because of the tapering pinblock the strings of this instrument are not quite perpendicular to the registers. Don't forget then to angle these crosswise cuts accordingly. Drill or rout out a space in each hole to accommodate your jack tongues if necessary, and you are all set.

The registers may be installed with either fixed lower guides, in which case you attach them to the belly rail, or with the lower guides carried by the registers as shown in Figure 11. In either case, cut a hole in the spine at the end of the gap just large enough to allow you to get the registers out after the instrument is strung. There are no stop levers or other register changing devices. One register needs to be moveable so that you can turn it off for tuning purposes, but that does not require a lever.

When it comes to jacks, you could of course make your own from wood. Personally, I haven't the stamina. I have Hubbard jacks in three instruments and cannot praise them highly enough. They are made of delrin and work beautifully. If you use Hubbard jacks in this instrument, they will require only one additional operation after assembly — viz., put a 4-40 x  $\frac{1}{2}$ " fillister head screw in the bottom of each for an endpin so that you will be able to adjust plectrum height.

Paradoxically enough, this lovely instrument so superbly crafted by Ridolfi was destined, as were most Italian harpsichords, to be largely hidden from view in a box. These boxes or outer cases, though often elaborately and ornately decorated, were almost invariably less graceful and delicate than the inner case. Possibly the rationale for the outer case was that the inner needed to be protected. Or perhaps the styles of decoration then in vogue were more appropriately applied to a separate case. The fact that the instrument maker and the decorator were two different persons may also have encouraged the practice. But whatever the reasons for the earlier custom, I find the inner case too aesthetically pleasing to hide and also quite strong enough to survive without any protective box. Having made that decision, all one needs to do is to put legs and a lid on the inner case. Make the lid light —  $\frac{3}{8}$ " plywood is good. One flap is sufficient to cover the pinblock and jack rail. The keyboard remains exposed. You need to glue blocks to the thin spine to receive the screws for each lid hinge. If you cut these blocks to match the shape of your hinges, they don't look bad. Don't neglect to apply a light molding to the edge of the lid. The legs I turned and fluted in the Louis XVI style and attached with steel leg plates.

The case is painted. Use a good quality enamel that can be rubbed or use lacquer. Convention calls for doing the inside of the case, inside of the lid, and the nameboard in one color and the outside in another. I used dark bottle green and ivory on my first instrument and Chinese red and black on the second. The moldings are gilded. Use gold leaf if your pocketbook and temper permit. The most opportune time, by the way, to apply your finish to the case is before you glue in the soundboard.

The instrument so constructed is a faithful reproduction of an antique Italian harpsichord (even if you include the modifications described) and will sound like an antique Italian harpsichord. That sound is a lovely sound,

and all too rarely heard. I do not know, for example, of a recording that features an Italian harpsichord. Italian harpsichords are fairly common in the collections of those few museums that do own harpsichords, but rarely are they in playing condition. The limited funds available for restoration are almost always used to work on the bigger Northern European instruments. As a consequence, few harpsichord enthusiasts have ever heard a fine Italian harpsichord.

For continuo work the Italian harpsichord is unsurpassed. Though it is not as loud as a Northern type instrument, its distinctiveness of tone and its clear articulation enable it to be heard much better through an ensemble. Time and again I have gone to concerts only to listen in frustration as the continuo player labored unheard upon a gigantic two manual instrument. The tone of the large harpsichord blends too well with the orchestra. It is more nearly like that of a piano. Paradoxically, the lesser volume of the Italian can be heard better.

For solo work the Italian harpsichord is somewhat limited, of course. Dramatic changes in registration are not possible. Neither can it produce the volume of sound of a larger instrument. Nevertheless, in the performance of that music to which it is suited, it has few rivals. And lest you assume that music to consist of only the minor works of obscure composers, let me point out that this is the historically proper instrument upon which to perform the works of Scarlatti.

Regardless then of whether or not you decide to build the Ridolfi, do give heed to these neglected instruments. Try to get to hear one. Encourage museum curators to have them restored. If you buy from a professional builder, inquire whether he will build you an Italian reproduction. You need not be a purist or a moldy fig to appreciate these instruments, you need only to listen to them.

Dr. James R. Scroggs  
Bridgewater State College, Mass.

This one manual Italian harpsichord was built in 1665 by Girolamo Ridolfi and is one of the interesting instruments being held as a public trust by the Smithsonian Institution. The inscription on the name board reads "Jacobus Rodolphus Hieronymi de Zentis Discipulus MDCLXV Facieba," indicating that Ridolfi was a student of Girolamo Zenti.

The outer case of this instrument is particularly heavy but conceals a beautifully delicate harpsichord which rests inside. The inner case is shown in a photograph which appears on page 8.

The painted decoration on the case seems to have been added later. The three cupids are covered with gilt and appear rather gross because of their larger-than-life size. This was necessary in order to raise the keyboard up to playing height. The ponderous garlands and tassels can claim no excuse. Their heaviness and exaggerated size appear to pull down the very instrument the cupids are trying so desperately to hold up.

Through special arrangement with Anders Richter, Director of the Smithsonian Institution Press, the technical description of this instrument, which was researched and written by John D. Shortridge and published as Bulletin 225 "Italian Harpsichord Building in the 16th and 17th Centuries", appears as a full-length feature article beginning on page 12. The paper appears unedited and in its original form.







**H**ARPSICHORD  
*of* **N**OTE

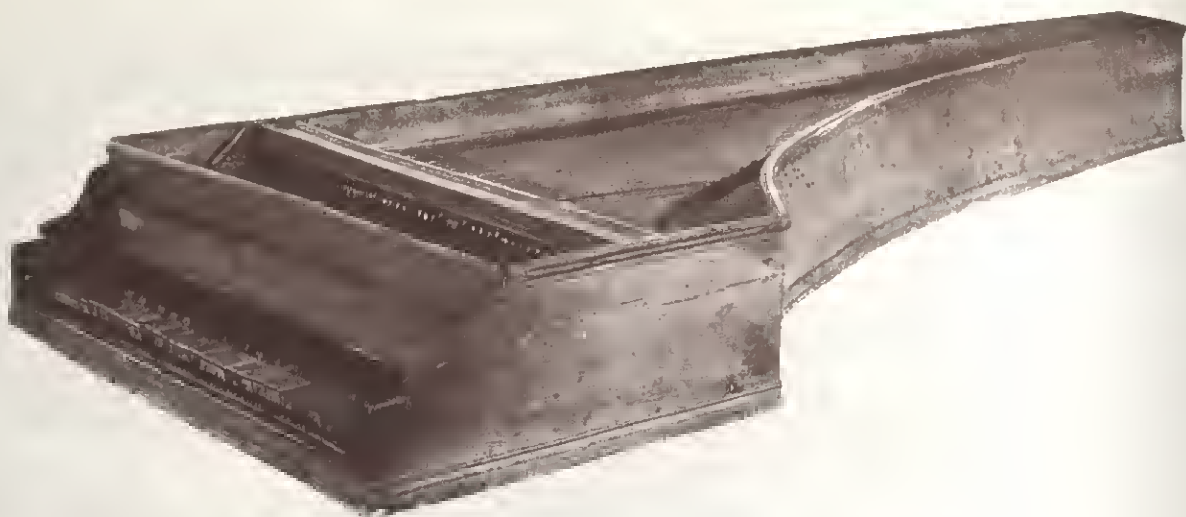
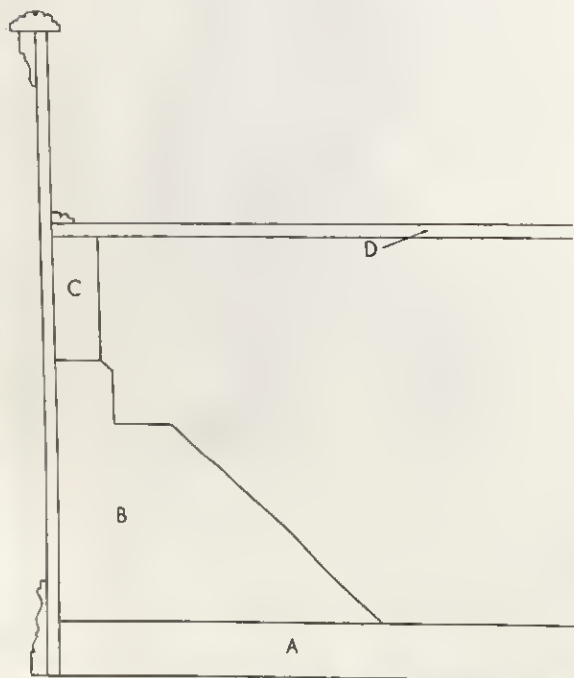


Figure 7.—RIDOLFI HARPSICHORD REMOVED FROM CASE. (Smithsonian photo MNH 238-A.)

### The Typical Italian Harpsichord

The instrument chosen to illustrate the stylistic features of the Italian harpsichord is also in the collection of the U.S. National Museum. This harpsi-

Figure 8.—CROSS SECTION OF RIDOLFI HARPSICHORD.  
A, bottom; B, knee; C, lining; D, soundboard. Scale, 1:2.



chord, purchased for the Museum in 1892 by Dr. G. Brown Goode, was made in 1665 by Giacomo Ridolfi, who claimed Girolamo Zenti as his teacher. The inscription on the nameboard reads "Jacobus Rodolphus Hieronymi de Zentis Discipulus MDCLXV Facieba."

Like the virginal described above, this harpsichord is separable from its outer case. The outer case rests on a separate stand consisting of three gilt cupids and a floral garland. Since the painted decoration of this case is not original, another outer case, belonging to a harpsichord made by Horatius Albana in 1633, was selected for the illustration (fig. 1).

Two unison strings per key and two registers of jacks are provided. The apparent compass of the keyboard is from C/E to c'''. The remains of pedal connections can be seen on the lowest eight keys.

The sides of the harpsichord are  $\frac{3}{8}$ " thick; the bottom is  $\frac{1}{8}$ " thick. The sides and lining are supported by knees that do not extend clear across the bottom of the instrument as they do in the virginal.

The knees are small triangular pieces, as shown in figure 8. Since the added tension of the second set of strings demands a somewhat more substantial framework than that employed in the virginal, a series of braces are attached to the floor. These are connected to the lining by several diagonal braces (fig. 9). This produces a remarkably strong but very light structure. The keys (not shown) are of more constant length than those of the virginal; therefore, the touch is much more uniform.



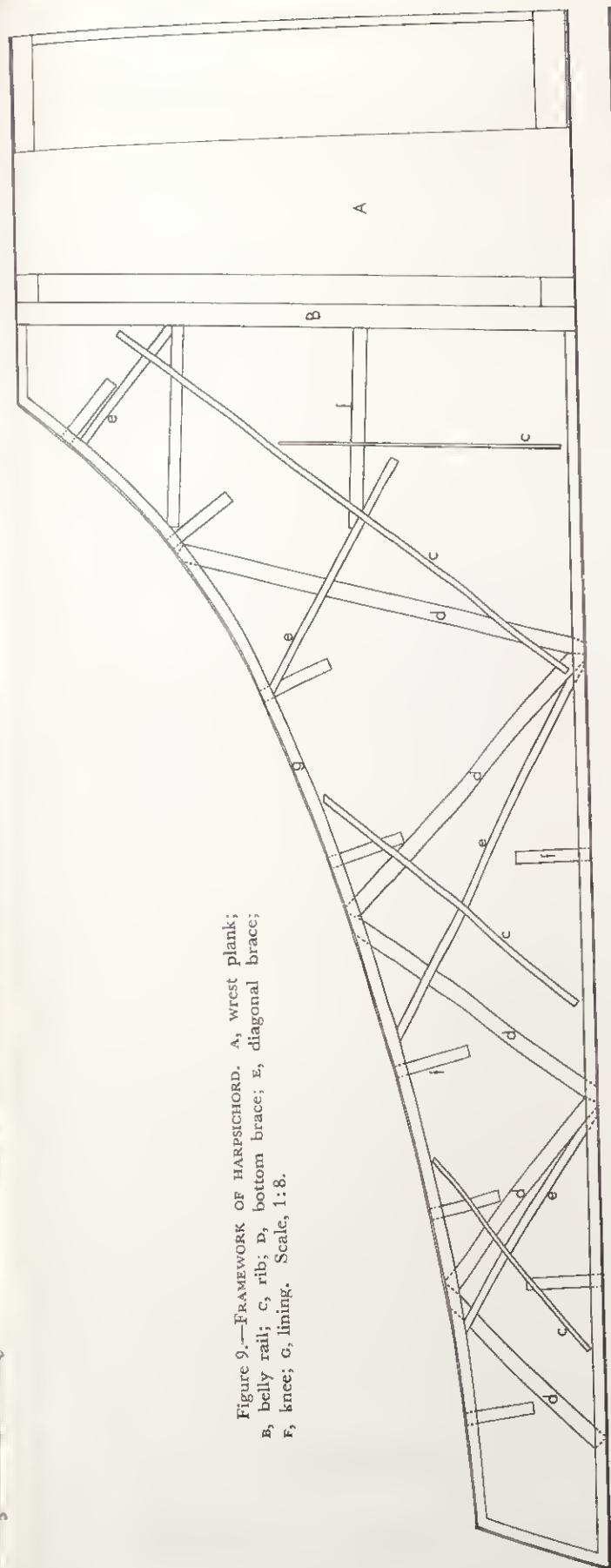


Figure 9.—FRAMEWORK OF HARPSICHORD. A, wrest plank;  
B, belly rail; C, rib; D, bottom brace; E, diagonal brace;  
F, knee; G, lining. Scale, 1:8.

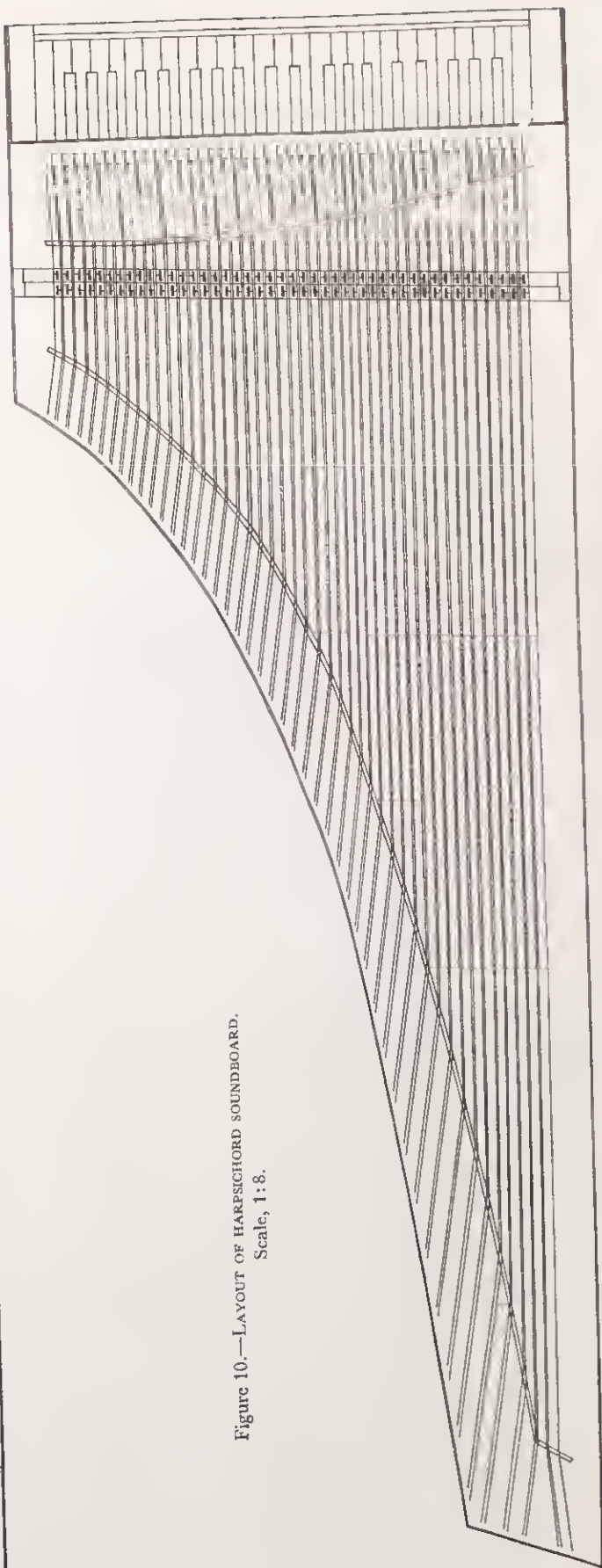


Figure 10.—LAYOUT OF HARPSICHORD SOUNDBOARD.  
Scale, 1:8.

The wrest plank is supported by two end blocks, against which the partition behind the action (called the belly rail) is also placed. The soundboard is glued to the top of the belly rail. The wrest plank is veneered with cypress, giving the appearance that the soundboard extends over it. The jack guides also rest on the end blocks in the space between the wrest plank and the belly rail. Figures 8 and 11 clarify the arrangement of these structural features.

Figure 10 shows the layout of ribs, bridges, and strings on the soundboard. The soundboard is about  $\frac{1}{8}$ " thick. The bridge on the wrest plank tapers in height from  $\frac{3}{8}$ " in the treble to  $\frac{1}{16}$ " in the bass and in width from  $\frac{5}{16}$ " to  $\frac{7}{16}$ ". The soundboard bridge measures about  $\frac{3}{8}$ " by  $\frac{1}{4}$ " and has virtually no taper. The soundboard does not have a rose, although that decorative device is fairly common on Italian harpsichords.

The jack guides are built up of spacer blocks held together by thin strips along the sides. There is now no provision for moving the guides, although plugged-up holes visible in the right end of each guide suggest that they originally could be disengaged. In Italian harpsichords generally, the jack guides were controlled by knobs projecting through the sides of the case. Sometimes these harpsichords had levers pivoted on the wrest plank and attached to the guides. The Ridolfi case has not been patched and there are no holes in the wrest plank where levers could have been attached; so, the guides probably were not intended to be movable.

The jacks are simple slips of walnut measuring about  $\frac{3}{8}$ " by  $\frac{7}{8}$ " by  $3\frac{3}{8}$ ". The arrangement of the tongue, spring, plectrum, and damper are shown in figure 11. The dampers are small pieces of buckskin held in slots at the tops of the jacks. The plectra, perhaps not original, are of leather. Of course, there are no adjusting screws or capstans of any variety.

The direction in which the plectra of each row of jacks should be pointing is not known. Two clavictheria having two registers of strings and a single row of double tongue jacks have been examined by the author. Each of these jacks has two plectra, one pointing to the right and one to the left. Turning these jacks around does not alter the order of direction. The plectra nearest the keyboard point the same way whether the jack is upside down or not. In the clavictherium at the Smithsonian Institution the plectra nearest the keyboard point to the player's left. In a clavictherium at the Boston Museum of Fine

Arts the opposite is true. Probably both arrangements were used in harpsichords also.

## String Lengths and Pitch Standards

The vibrating lengths of the strings of the polygonal virginal and of the Ridolfi harpsichord can be roughly determined from the drawings. For purposes of comparison, a tabulation of the vibrating lengths (in inches) of the C strings on both instruments follows:

	Polygonal virginal	Harpsichord
c'''	6 $\frac{1}{4}$	5 $\frac{1}{16}$
c'' (pitch C)	12 $\frac{1}{16}$	10
c' (middle C)	25 $\frac{1}{16}$	20 $\frac{1}{2}$
c	43 $\frac{1}{16}$	42 $\frac{1}{16}$
C/E	50 $\frac{1}{16}$	61 $\frac{1}{4}$

The lengths shown for the harpsichord represent the shorter of the two strings with which each key is provided.

In order to produce a uniform tone color throughout the compass of a stringed instrument, it is necessary, among other things, to have the tension of all the strings reasonably uniform. In the treble this is accomplished by varying the string lengths. Since the length of a vibrating string is inversely proportional to its frequency, each string is made about half as long as the string an octave below, two thirds as long as the string a fifth below, etc. This principle cannot be carried all the way into the bass since the lowest strings would be inconveniently long, so somewhere below middle C the strings are gradually shortened and the diameters of the wires are increased in compensation.

As the above comparison shows, the string lengths are approximately doubled at each descending octave down to c' on the virginal and c on the harpsichord. The shape of the case allows the harpsichord to have longer bass strings than the virginal; between c' and c the string length is doubled in the harpsichord. However, in the virginal the c string is considerably less than twice as long as the string an octave above. In fact, the bass strings of the virginal are shortened to such an extent that the lowest string of the harpsichord is much longer than the lowest string of the virginal, although in the treble the virginal has longer strings than the harpsichord.

If the length of one treble string of an instrument of this sort is known, the lengths of all but the bass strings



can be readily inferred; we can approximately describe the lengths of two-thirds to three-fourths of the strings of either of the above instruments by giving the length of one string. It has become customary to use  $c''$  for this purpose, and to refer to it in such cases as pitch  $C$ .

In examining a number of Italian harpsichords and virginals dating from 1540 to 1694, lengths for pitch  $C$  ranging from  $8''$  to  $13\frac{3}{4}''$  have been found. This seems to be a great discrepancy for instruments that are otherwise so standardized. Since a uniform standard of pitch did not yet exist in the 16th and 17th centuries, we would expect the string lengths employed to be varied somewhat in order to accommodate the instruments to higher or lower tunings. Also, a preference for the sound of thinner, longer wires or shorter, thicker ones may have caused some builders to increase or decrease the string lengths on their instruments in proportion to the string diameters chosen. We have no precise evidence concerning the original wire gauges of the strings of Italian harpsichords and virginals. Although the variety of pitch  $C$  lengths encountered on the instruments studied can partially be accounted for by these two factors, a third and more important cause existed.

Among the 33 instruments about which information has been secured, a correlation is discernible between the apparent manual compass and the pitch  $C$  string lengths. Sixteen of the instruments ascend to  $f'''$ . For these, the length of the pitch  $C$  string varies from  $10\frac{1}{4}''$  to  $13\frac{3}{4}''$ . The remaining instruments, with either  $a''$  or  $c'''$  as the highest notes, have pitch  $C$  strings ranging from  $8''$  to  $11\frac{3}{8}''$  in length. If the average tension and wire diameter of the two groups are assumed to have been about equal, the difference in string lengths would suggest a corresponding difference in pitch, the instruments having the compass extended to  $f'''$  sounding somewhat lower than the others.

There is some historical evidence that this actually was the case. In his *Theatrum Instrumentorum* Michael Praetorius<sup>1</sup> pictures a polygonal virginal, which appears to be very much like the many Italian examples that survive today, and a rectangular virginal that seems to be Flemish. He specifies that both are *so recht Chor-Thon* (at regular choir pitch). Praetorius also shows a harpsichord<sup>2</sup> that looks like a typ-

<sup>1</sup> Michael Praetorius, *Theatrum Instrumentorum*, Wolfenbüttel, 1620, pl. 14.

<sup>2</sup> *Ibid.*, pl. 6.

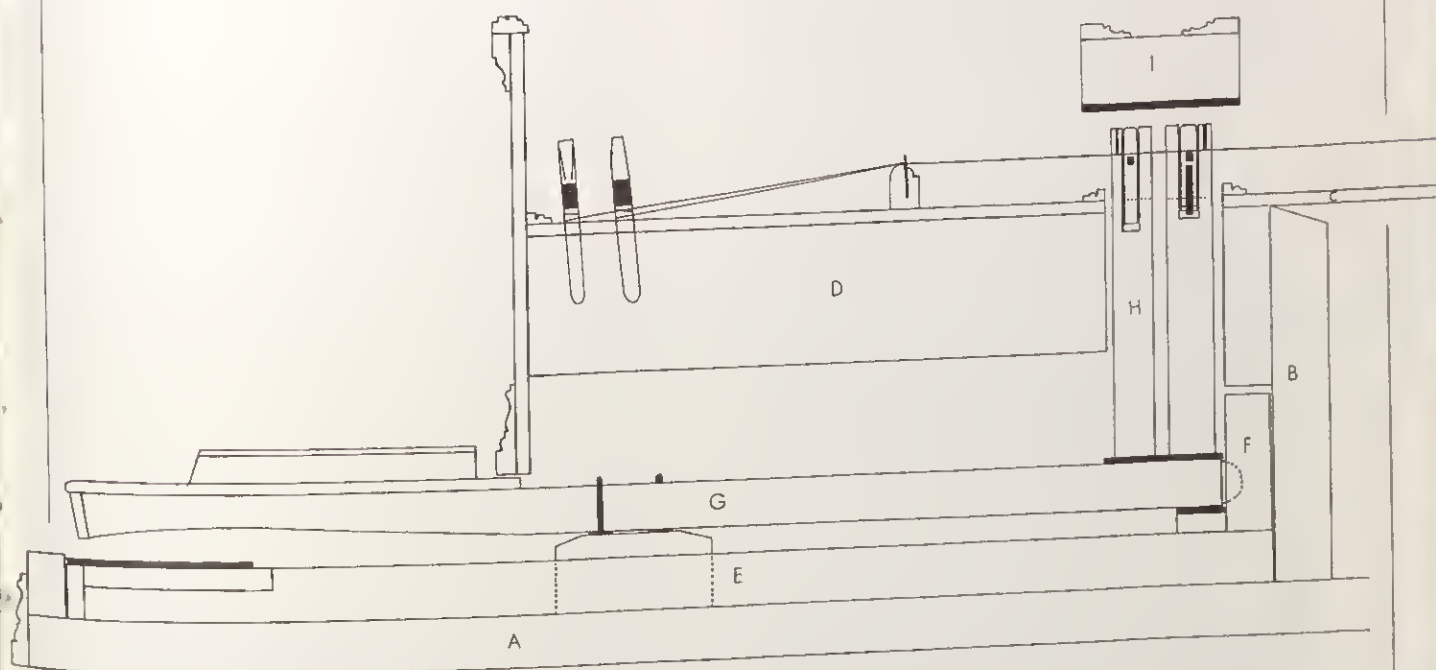


Figure 11.—ACTION OF HARPSICHORD. A, bottom; B, belly rail; C, soundboard; D, wrest plank; E, key frame; F, rack; G, key; H, jack; I, jack rail. Scale, 1:2.

ical Italian instrument except for the presence of a set of strings tuned an octave above unison pitch, a rare feature on Italian harpsichords. This harpsichord is described as *so eine Quart tieffer alss Chor-Thon* (a fourth lower than choir pitch), clearly indicating that single manual keyboard instruments a fourth apart in pitch were in existence. Since no reason is given for the harpsichord being tuned a fourth lower than the two virginals, we may assume that the author considered the matter commonplace enough as to demand no further elaboration and that instruments a fourth apart in pitch were not rare.

Praetorius does not state that the harpsichord in his illustration was tuned to a low pitch standard, which was actually used for certain purposes or in particular localities. He discussed the numerous pitches in use before and during his time, but the only one that he mentioned as being a fourth below choir pitch he considered obsolete and suitable only for plainsong. If the harpsichord was not intended to be tuned to this standard and used for this purpose, it must have been tuned to choir pitch and treated as a transposing instrument.

Querinus van Blankenburg,<sup>3</sup> writing in 1739, states:

At that time [the beginning of the 17th century], men had so little experience in transposition that in order to be able to transpose a piece a fourth downwards they made a special second keyboard in the harpsichord for this purpose. This seems incredible, but the very remarkable proof is the fact that the famous Ruckers from the beginning of the last century for a period of more than thirty years made harpsichords only in this way.<sup>4</sup>

That the second manual of the two-manual harpsichord originated as a device for transposition is well known. In an article titled "Transposing Keyboards on Extant Flemish Harpsichords," Sibyl Marcuse<sup>5</sup> discusses surviving examples that show how the second keyboard was arranged. The upper keyboard was the principal one, with the lower keyboard sounding a fourth below. The strings acted upon by a *c* key on the upper manual were sounded by an *f* key on the lower; so, in changing from the upper manual to the lower, the player would have to move his hands to the left the distance of a perfect fourth in order to

strike the same keys, thus producing the downward transposition. The compass of the upper manual was *E/C* to *c'''*. Since the lower keyboard was shifted to the left, space was provided for five additional keys at its treble end. The apparent treble range of the lower keyboard was therefore extended to *f'''*, although the lower *f'''* and upper *c'''* keys worked on the same strings and produced the same pitch. Room was also made for five extra bass keys at the lower end of the upper manual. However, since short octave tuning was employed and it was desirable to be able to use the same fingering in the bass on both manuals, the tails of the *C/E*, *D/F#* and *E/G#* keys of the upper manual had to be bent to the left in order to work on the strings played by the *F*, *G*, and *A* keys respectively of the lower manual. The vacant space to the left of the upper manual *C/E* was filled by a block of wood. Hence the five extra bass strings not used by the upper manual were those played by the *C/E*, *D/F#*, *E/G#*, *B*, and *c#* keys of the lower keyboard.

Of the 16 Italian harpsichords and virginals studied that ascend in the treble to *f'''*, 13 range to *C/E* in the bass, thus having exactly the same compass as the lower (transposing) keyboard of the Flemish two-manual instruments. Twelve of the 14 Italian examples having *c'''* as the highest key stop on *C/E* in the bass and are identical in apparent compass to the Ruckers upper manual.

The correlation of compass and string length of the Italian instruments, the statements of Praetorius, and the similarity of the Italian keyboard ranges to those of the Ruckers transposing harpsichords have been considered. A plausible conclusion is that the Italian instruments extending to *f'''* were transposing instruments sounding a perfect fourth lower than the prevailing pitch standard. Adopting the terminology used for orchestral wind instruments, these could be referred to as harpsichords in *G*.

The evidence of the correlation between string length and compass becomes much more convincing if we assume that the Italian builders abandoned the practice of making transposing harpsichords about the same time that the Ruckers family stopped employing the transposing lower manual. In the quotation previously given, Querinus van Blankenburg tells us that the Ruckers did not make transposing instruments later than the 1630's. Of the 10 dated Italian instruments with the keyboard extended to *f'''*, only three were made after the third decade of the 17th

<sup>3</sup> Querinus van Blankenburg, *Elementa Musica*, The Hague, 1739.

<sup>4</sup> Translation by Arthur Mendel in "Devices for Transposition in the Organ before 1600," *Acta Musicologica*, 1949, p. 33.

<sup>5</sup> Sibyl Marcuse, "Transposing Keyboards on Extant Flemish Harpsichords," *Musical Quarterly*, July 1952.



century. Each of these has a shorter pitch *C* string than any of the seven earlier instruments. These three harpsichords, dated 1654, 1658, and 1666, are accordingly considered nontransposing instruments, with the extra treble keys representing an actual extension of the upward range. The six undated instruments with *f'''* in the treble are classified as transposing instruments because of their pitch *C* lengths and are accordingly believed to have been made before about 1635.

The 33 instruments on which this study is based are classified in the list on page 107. They are grouped according to whether the highest key is *f'''* or *c'''*, with the exceptions of the three harpsichords mentioned in the preceding paragraph and three instruments that go only to *a''*. That the three instruments ending on *a''* belong with the nontransposing group is indicated by their string lengths.

The listing gives additional information about each example. String lengths of instruments having two registers are for the shorter of the two pitch *C* strings.

Information has been secured on two Italian virginals which were not included in the tabulation. Their measurements are completely at variance with the pattern consistently set by the other 33 examples studied. One, made by Giovanni Domenico in 1556, is in the Skinner collection; it has a pitch *C* string  $14\frac{1}{16}''$  in length and an apparent compass of *C/E* to *c'''*. The other, with the same apparent compass and a  $7\frac{1}{2}''$  pitch *C* string, is at Yale University. Whether these instruments are exceptional in terms of the pitch to which they were tuned, the tension which was applied to the strings, or the thickness and weight of the strings themselves, has not been determined.

The average of the pitch *C* lengths of the transposing instruments in the list is 12.78''; that of the nontransposing group is 10.45''. This suggests a separation between the two groups of about a major third since the first average is roughly  $\frac{2}{3}$  of the second. However, the fact that the separation of the two averages is not great enough to positively indicate

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a perfect fourth—the first average would have to be  $\frac{2}{3}$  of the second to do so—does not disprove the theory of transposition by a fourth. In the first place, a considerable variety of pitches is no doubt represented in both groups since a universal pitch standard did not exist in the 16th and 17th centuries. Also, a margin of error of only a semitone is as good as could be expected considering the small number of examples on which the averages are based.

A further possible justification for the relationship of the two averages is found in Praetorius' discussion of the pitch standards with which he was familiar.<sup>6</sup> He states that choir pitch was a major second lower than chamber pitch and that *tertiam minorem* was a minor third lower than chamber pitch. Praetorius says of *tertiam minorem*:<sup>7</sup>

But in Italy and in various Catholic choirs in Germany, the said lower pitch is much in use. For some Italians, not unjustly, take no pleasure in high singing, and maintain it is not beautiful, and the words cannot be properly under-

stood, and it sounds like crowing, yelling, singing at the top of one's voice . . .

Possibly some of the nontransposing instruments were tuned to choir pitch and others to *tertiam minorem*, while the transposing instruments were set a fourth lower than choir pitch.

Three of the instruments listed are ottavinas, small instruments tuned an octave higher than usual. Ottavinas correspond to a four-foot register. Mersenne<sup>8</sup> mentions that they existed in two sizes, one a fifth above the usual pitch and the other an octave above. The three ottavinas included in the table are considered to be of the size sounding an octave above the usual pitch because they have *C/E* to *c'''* ranges and pitch *C* string lengths about half the average length of the other instruments in the nontransposing group. Although no examples were found for inclusion in this study, it is probable that some ottavinas a fifth above the usual pitch—and therefore an octave higher than the transposing instruments in our listing—survive. Such instruments would be expected to have apparent ranges of *C/E* to *f'''* and pitch *C* strings between  $5\frac{3}{4}''$  and  $6\frac{3}{4}''$  in length.

<sup>8</sup> Marin Mersenne, *Harmonie Universelle*, Paris, 1636, p. 101.

<sup>6</sup> Michael Praetorius, *Syntagma Musicum*, Wolfenbüttel, 1614–1620, vol. 2 (*Organographia*), chapter 2.

<sup>7</sup> Translation by Arthur Mendel in "Pitch in the 16th and early 17th Centuries, Part II," *Musical Quarterly*, April 1948.

# THE "DELRIN" BIOGRAPHY

by Ray McGlew

As a research associate in the Plastics Laboratory at DuPont's Experimental Station, Al Webber has contributed importantly in the introduction of assorted chemical marvels. For example, he's had a hand in the development of physical tests and standards for nylon and "Teflon" fluorocarbon resins, as well as in classifying fatigue and stiffness properties of "Delrin" acetal resin. He's currently engaged in working out international standards of measurement with other plastics suppliers and users.

He looks the part. You suspect that he's much more at home among impact testing devices than he is, say, on the cocktail circuit. But then he casually mentions the fact that he's been taking organ lessons and you begin to wonder if there's substance to the tales of his role in finding the "lost chord." When he goes on to relate how he conducted a student orchestra during his teaching days and how he still plays the trombone on occasion, you put the question to him bluntly: Is he the man who shattered the academic quiet of these precincts with a harpsichord recital?

"It's not as bizarre as it might seem," Webber grins, "but I'm your man."

The incident — now a full-blown legend at the "X" Station — was really based in sobersided research. Webber hastens to add. "We weren't looking for the lost chord or anything as exotic as that. It was a perfectly practical study carried on in the basement here to determine if 'Delrin' could pluck a sweeter note on a harpsichord than leather or crow quills can."

If the experiment did produce any missing chords, it was because they had never really been lost — merely put on inactive duty when harpsichord manufacturers substituted leather for crow quills in the instrument's plectra.

"Crow quills, inserted in the tip



Dr. Alfred C. Webber, Research Associate at DuPont's Experimental Station is the key figure in this unique story of how "Delrin" got from the plastics lab into the harpsichord.

or 'tongue' of an eight-inch wooden 'jack,' constituted the plectra which provided the light melodic sound that dominated European court revels prior to the American Revolution," Webber continues. "They played beautifully but they had an embarrassing flaw — a tendency to snap off in the middle of an arpeggio. Replacement plectra made of leather gave off a duller sound and eliminated some of the chord effects originally attainable. But they did offer dependability, and by 1900 leather had become standard in the few harpsichords still being made."

By that time, however, the "big sound" of the day was the piano, the real villain in the near-demise of the harpsichord more than 100 years ago. Introduced around 1750, the piano succeeded such instruments as the dulcimer and clavichord. Its more rigid frame, which enabled players to hammer out notes with considerable expression, made it popular almost im-

mediately. By contrast, the plucked sound of the harpsichord, while offering a wider register, could not compete in volume. Nor could its quills compete in durability.

"The piano came to the fore because it could phrase a line better," Webber interprets. "And with its wider range of sound it could better conform to the human voice. The transparent sound and contrapuntal notes of the harpsichord were charming, but I guess the musical stylesetters of the piano period just didn't dig them."

They might not have dug the sound, but they almost succeeded in burying the classical instrument.

Thanks to Beethoven, Brahms and Schubert and similar titans, the piano has become the touchstone of music, while the harpsichord has escaped extinction only because it fills the sometimes needs of such diverse artists as Igor Stravinsky (*The Rake's*



*Progress*), Artie Shaw (some prewar recordings by his Grammercy Five feature an amplified harpsichord) and Rosemary Clooney ("Come On 'a My House").

So at best only five or six harpsichords a year were being custom-built in this country in 1948 when Bill Dowd, the man who was to trigger the laboratory legend about Webber, and Frank Hubbard took English degrees at Harvard and then plunged into careers as musical antiquarians. Convinced that they could recapture the long-lost tonal perfection of the harpsichord with modern materials, Dowd and Hubbard set up shop in a factory loft near Boston. By 1958 their hand-crafted instruments, made for collectors and a growing band of harpsichord buffs, had firmly established their reputations as manufacturers, but they were still as far away from their original goal as ever.

The partners had tried nearly every possible combination of wood, leather, metal and ceramic as a crow quill substitute and had run the gamut of existing plastics when a mutual acquaintance put them in touch with Webber. And in Webber they found both a musical and a scientifically sympathetic ear.

Webber says, "'Delrin' was still two years away from commercialization at that time and DuPont was looking for the kind of actual-use data on fatigue resistance and resiliency that harpsichords could supply."

Webber got better than he bargained for when he provided the firm with experimental quantities of the new material in exchange for a promise of a full test report — he hasn't figured out how to incorporate the resultant phraseology in a graph or chart even yet. "'Delrin' works even better than crow quill," came back the ecstatic appraisal. "The tones are clean and bright. We wore out an electric motor testing the new plectrum against a wire, but we've calculated that a harpsichordist could practice Bach's 'Chromatic Fantasy' for four hours a day, every day for two years without 'Delrin' breaking or showing

more than the slightest signs of wear."

"That makes a pretty good testimonial," we suggest. "Of course, they officially adopted 'Delrin'?"

"Oh, yes," Webber replies. "Dowd (the partnership had split into two separate firms) placed an order for 50 feet of 20 mil sheet — said it ought to last him a lifetime."

"Well," we offer diplomatically, thinking of the thousands of pounds of "Delrin" DuPont manufactures daily, "it probably produced considerable scientific knowhow. You did go to quite a bit of trouble, though, having a concert and all . . ."

"I was hoping you wouldn't forget the concert," Webber interrupts. "When Dowd brought a harpsichord down here two years ago to show us how well 'Delrin' worked in the plectra, we made another breakthrough. We demonstrated how the low coefficient of friction and surface characteristics of 'Delrin' would improve the performance of a harpsichord's jack and tongue, too. Now he's redesigned the whole elevator system, using 'Delrin' to obtain a smoother, quieter action."

"Sales of harpsichords are booming, too — 300 to 400 a year," adds the lab legend. "With three to four pounds of 'Delrin' in each instrument, that's something to crow about."

Ray McGlew

## LETTERS

Dear Mr. Haney:

Here is my renewal check for membership. You are doing a great job and I thank you.

I expect that Mr. Sear's article about electronics in music (*The Harpsichord*, Vol. III, No. 4) is going to generate a lot of feed-back both positive and negative. I certainly can't dispute his facts, but some of his conclusions are those of a super-specialist.

Mr. Sear, with his Moog, filters, echo, and etc. just may be able to duplicate the sound of a recorded harpsichord, but I'll bet he's light years away from the sound of a harpsichord in concert or the living-room. It is a fact that most music is heard via electronics today, but this does NOT make the loudspeaker sound the more real. This sort of logic carried forward brings on horrible visions of some future Dowd trying to make a harpsichord that sounds like a loudspeaker.

When you see a concert hall with an elaborate sound reinforcing system, you know that the designers did a rotten job — perhaps with the engineers in mind.

If Mr. Sear's pianist cannot be heard above the orchestra, it is because the orchestra is playing too loudly — not that the piano is at fault. Please! We're all going to be deafened.

Large concert halls with their large orchestras and opera and ballet companies are all, as far as I know, on their knees financially. But, at least in this area, small halls and musical groups (mercifully un-amplified) are breaking even or showing small profits.

So, I'd like to say to Mr. Sear: "More power to you and your 'new sound' via electronics. I even envy you your exploration. If you'll keep your pickups out of my harpsichord, I'll keep my raven quill out of your Moog. OK?"

Roy Davenport  
Mill Valley, California

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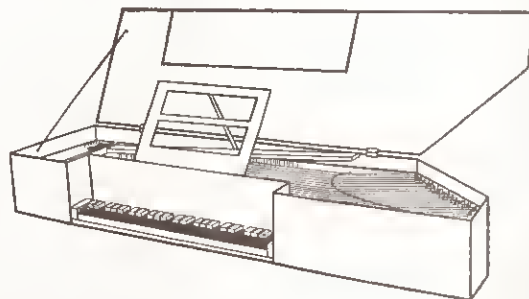
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